STAT*3110: Introductory Mathematical Statistics II

Winter 2018

General information

Lecture Time and Location
MWF: 3:30-4:20pm at MACK 229

Course description
Estimation, unbiasedness, Cramer-Rao inequality, consistency, sufficiency, method of moments, maximum likelihood estimation; hypothesis testing, Neyman-Pearson lemma, likelihood ratio test, uniformly most powerful test; linear regression and correlation; non-parametric methods.

Instructor
Prof. Zeny Feng
Email: zfeng@uoguelph.ca

Office hour
Wednesday, 10:30-11:30am at MACN 540
Please make use and respect the office hour.

Teaching Assistant
Zheng Song, Tuesday, 1-2pm at MACN 536

Prerequisites
Stat*3100 Introductory Mathematical Statistics I.

Course Resources

Course Website
Go to `https://courselink.uoguelph.ca`. Use your central login ID and password to login. Lecture notes, assignments, solutions, other course material, and course announcements will be posted on the course website. It is your responsibility to check that posted marks are accurate.

Recommended Readings

1. John E Freund's *Mathematical Statistics with Applications*, 7th ed., by Miller & Miller, Pearson Education Canada.

2. Hogg, McKean, and Craig's *Introduction to Mathematical Statistics*, 7th edition by Pearson Education, Inc.

Lecture Note
A complete set of lecture notes will be posted on CourseLink before the term starts. It is expected that students will bring in a copy of these notes and will fill them in during lectures. Completely filled lecture notes will not be posted online.

The Lecture notes are not to be re-distributed in any form.

Computer Software
The primary statistical software package that will be used in this course is R, which is freely available for download at `http://www.r-project.org/` Students are strongly encouraged to install R on their personal computers.

<u>Course Content</u>

Specific Learning Outcomes

After the completion of the course, students should be able to

- find the distribution function of a general rth order statistic, minimum statistics and maximum statistics,

- find a point estimate based on method of moments, maximum likelihood estimation and Bayesian estimation,

- evaluate the performance of a given point estimate based using the 4 criteria: unbiasedness, efficiency, consistency and sufficiency,

- find the Cramér Rao's lower bound of the variance for unbiased estimators,

- determine whether a point estimate is an uniformly minimum variance unbiased estimate (UMVUE),

- find confidence intervals for scale and location parameters,

- understand basic idea and concepts in hypothesis test, formulate a hypothesis test,

- understand the fundamental theory of Neyman-Pearson Lemma and its applications and extensions,

- understand the idea of likelihood ratio test,

- sketch the power function of a test and from there, compute the type I error and the power,

- construct a hypothesis test involving means, variance, and proportions,

- perform the χ^2 test, goodness-of-fit test, know the connection between these two tests and their applications.

Lecture Content

- Review of expectation, probability distributions, and change of variables

- Order statistics

- Point estimation evaluations: unbiasedness, efficiency, consistency, sufficiency

- Method of finding point estimators

- Interval estimation

- Hypothesis testing: some theories

- Practical solution for test of hypotheses involving means, variances, and proportions

- Nonparametric tests

Evaluations

- Assignments 30%, tentative due dates: January 26, February 9, March 2, March 23, April 6 (all on Friday)

- Midterm 25%, tentatively scheduled on Friday, March 9, in class

- Final exam 45%, Thursday, April 12, 2:30 - 4:30pm

Course policies

Grading Policies
Assignments are due 4pm on the due date. Please submit your assignment through the Crowdmark system. No late assignments will be accepted, and late or missed assignments will receive a grade of 0 automatically. Assignment will be marked by TA and returned through Crowdmark system. Therefore, queries on assignments should be presented to the TA. If you are unable to submit an assignment with a valid reason (appropriate documentation is needed, e.g, doctor note for the illness), then, your mark will be based on the remaining assignments. While you are encouraged to discuss the assignment problems with fellow students, each student must hand in an individual solution which is the result of his/her own effort.

Midterm test will be held in class and therefore no student should have a conflict with the date or time. If a conflict does exist, it is your responsibility to resolve it immediately. Students who missed the midterm for a valid, documented reason (such as medical illness) must contact me within 3 business days of the midterm, and provide the appropriate document for approval. In this situation, the weight of the missed midterm test will be added to the final exam.

Any work that is submitted for regrading, I reserve the right to regrade the entire written component of the assignments and test, not just the question under consideration.

The final exam (date, time and location) is scheduled by the Registrar's Office. If you miss the final exam for any reason, you must contact your program counsellor for advice. University regulations require specific procedures to be followed regrading the conduct of final examinations, including resource, if any, for missed final examinations. These procedures are out of my control.

Use of electronic devices and recording of lectures

Electronic recording of classes is expressly forbidden without consent of the instructor. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the instructor.

University Policies

Academic Accommodation of Religious Obligations
If you are unable to complete a course requirement due to religious obligations, please let the instructor know within the first two weeks of class. See the academic calendar for more information:
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Academic Consideration
When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, student ID#, and email contact. See the academic calendar for information on regulations and procedures:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Academic Misconduct
The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community, faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring.

University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submis-

sion of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/
c08/c08-amisconduct.shtml

Accessibility
The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible. Contact CSD at: 519-824-4120 ext 56208, or email: csd@uoguelph.ca.

Drop Date
The last date to drop this course, without academic penalty, is Friday, March 9. For regulations and procedures for Dropping Courses, see the Academic Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/
c08/c08-drop.shtml